is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim recitation to examples containing only one such recitation, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an" (e.g., "a" and/or "an" should be interpreted to mean "at least one" or "one or more"); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation is explicitly recited, those having ordinary skill in the art will recognize that such recitation should be interpreted to mean at least the recited number (e.g., the bare recitation of "two recitations," without other modifiers, means at least two recitations, or two or more recitations). Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, etc." is used, in general such a construction is intended in the sense one having ordinary skill in the art would understand the convention (e.g., "a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to "at least one of A, B, or C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, or C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase "A or B" will be understood to include the possibilities of "A" or "B" or "A and B."

[0057] In addition, where features or aspects of the disclosure are described in terms of Markush groups, those skilled in the art will recognize that the disclosure is also thereby described in terms of any individual member or subgroup of members of the Markush group.

[0058] As will be understood by one having ordinary skilled in the art, for any and all purposes, such as in terms of providing a written description, all ranges disclosed herein also encompass any and all possible sub-ranges and combinations of sub-ranges thereof. Any listed range can be easily recognized as sufficiently describing and enabling the same range being broken down into at least equal halves, thirds, quarters, fifths, tenths, etc. As a non-limiting example, each range discussed herein can be readily broken down into a lower third, middle third and upper third, etc. As will also be understood by one skilled in the art all language such as "up to," "at least," "greater than," "less than," and the like include the number recited and refer to ranges which can be subsequently broken down into sub-ranges as discussed above. Finally, as will be understood by one skilled in the art, a range includes each individual member. Thus, for example, a group having 1-3 cells refers to groups having 1, 2, or 3 cells. Similarly, a group having 1-5 cells refers to groups having 1, 2, 3, 4, or 5 cells, and so forth.

[0059] While various aspects and examples have been disclosed herein, other aspects and examples will be apparent to those skilled in the art. The various aspects and examples disclosed herein are for purposes of illustration and are not intended to be limiting, with the true scope and spirit being indicated by the following claims.

What is claimed is:

1. A tactile display device that uses a driving fluid to form a tactile image, the tactile display device comprising:
- a reservoir configured for containing the driving fluid;
- a plurality of toxel portions that are drivable by the fluid, each toxel being arranged to form a portion of the tactile image; and
- a pump member associated with the reservoir and toxel portions, wherein the pump member is arranged to selectively pump the fluid from the reservoir to selected toxel portions to display the tactile image.

2. The device of claim **1**, wherein the pump member comprises an electro-osmotic pump configured to pump the fluid electro-osmotically in response to an applied voltage.

3. The device of claim **1**, wherein the pump member is configured to selectively pump the fluid to generally activate toxels independently from each other.

4. The device of claim **1**, wherein the pump member comprises an electro-osmotic layer configured to electro-osmotically pump the fluid locally to selected ones of the toxels.

5. The device of claim **4**, further comprising a toxel layer that includes the plurality of toxels.

6. The device of claim **5**, wherein the toxel layer includes an elastomeric membrane having a pattern of the toxels, and configured such that the toxels are expandable generally independently of each other.

7. The device of claim **6**, wherein the elastomeric membrane includes stationary portions disposed between the toxels, wherein the stationary portions are relatively immobilized with respect to the toxels.

8. The device of claim **6**, wherein the toxels are elastically deformable in response to increased pressure of the fluid pumped into association therewith.

9. The device of claim **8**, further comprising an actuation layer associated with the pump member, wherein the actuation layer is arranged to selectively activate one or more pump member to selectively pump fluid to selected toxels in response to a signal corresponding to the tactile image to be displayed.

10. The device of claim **9**, wherein the actuation layer comprises a pattern of electrodes configured to receive a signal corresponding to a tactile image to be displayed and produce voltage differences across the electro-osmotic layer to pump the fluid locally to actuate the selected toxels and produce the tactile image.

11. The device of claim **9**, wherein the actuation layer is integral with the elastomeric membrane.

12. The device of claim **9**, wherein the actuation layer is attached to the electro-osmotic layer on a side of the electro-osmotic layer nearer to the toxel layer.

13. The device of claim **9**, further comprising a reservoir layer disposed on a side of the electro-osmotic layer opposite from the toxel layer, wherein the reservoir layer is defines the reservoir adjacent the electro-osmotic layer, wherein the actuation layer is disposed on the reservoir layer.